SYSTEM FOR DISTILLING LIQUOR AND DEVICES FOR THE SYSYTEM

FIELD OF THE INVENTION

In general, the present invention relates to a system for distilling liquor that uses multiple and repeatedly purifying processes to crack alcohol elements into tiniest molecules and then reform to achieve great alcohol elements to make generated liquor have high purity and dense scents.

BACKGROUND OF THE INVENTION

Heating wort or alcoholic paste (fermented dregs) after fermentation enables to vaporize liquor steam from the wort or the liquor paste. Then, the liquor steam is condensed and collected to obtain liquor. For example, rice is fermented and distilled to obtain rice wine. The rice wine is further purified to increase the alcohol concentration. However, conventional distilling method can not generate excellent liquor having high purity, dense aromatic smell, and mellow taste. Because conventional distilling method only repeatedly distills the alcoholic paste but can not sieve impure composition, such as inferior alcohol, out from the liquor steam. The inferior alcohol can not be isolated from great alcohol by repeated distillation processes so that the inferior alcohol still exists inside generated liquor. Therefore, the generated liquor does not have excellent quality.

SUMMARY OF THE INVENTION

The present invention provides a system for distilling liquor and device applied in the system to resolve problems of the conventional distilling method, wherein the system is designed for a purpose of separating inferior alcohol from great alcohol in the liquor steam so as to make the generated liquor have excellent quality, high purity, and mellow taste.

To achieve the foregoing purpose, first technical feature of the present invention

is that the system comprises multiple separable devices including a top layer, a middle layer, a bottom layer, and an outer cooling assembly, and four units correspondingly arranged within the layers and the outer cooling assembly to allow the system to be constructed and cleaned easily. The devices are made of stainless steel or other materials having excellent thermal-conducting and anti-corrosive capabilities to eliminate coating of limescale and corrosion to the devices so as to avoid malfunction of the devices. Additionally, the heating unit has an impurity depositing area with an impurity outlet attached to a bottom of the heating unit to collect and drain impurity and non-volatile materials out of the system via the impurity outlet. Therefore, the system enables to be operated fluently to extend operational life of the devices and repairing cost of the system is reduced.

A second technical character of the present invention is that the heating unit is modified to comprise a heater to heat the wort or the alcoholic paste inside the system to cause currents flowing in the system to accelerate the boiling of the wort or the alcoholic paste.

A third technical character of the present invention is that the cracking unit has at least one dissociating reducing device having functions similar as those of the geologic strata and the ground. High temperature liquor steam arises to flush to the at least one dissociating reducing device to generate frictional effects so that the dissociating reducing device generates vibration to crack and reform the molecules in the liquor steam. Great alcohol molecules in the liquor steam are separated from inferior alcohol molecules in the liquor. The inferior alcohol molecules unable to be cracked are condensed to become inferior liquor and then conducted back to a pan-shaped dividing plate to be vaporized again to complete a cyclically cracking process. The great alcohol

molecules in the liquor steam are conducted to the purifying distilling unit in the top layer.

A fourth technical character of the present invention is that the purifying distilling unit comprises a distilling tower. The distilling tower is composed of multiple distilling layers and each distilling layer has multiple ventilating holes defined therein. Each distilling layer is dome-shaped and has a top convex face and a bottom concave face to conduct liquor steam unable to pass through the distilling tower back to the cracking unit in the middle layer. Residual space inside the distilling layer contains the liquor steam. By flushing impact effects of the liquor steam induced by the ventilating holes in each distilling layer within the distilling tower, the liquor steam reformed by the dissociating reducing device in the cracking unit is sieved to allow only the tiniest alcohol molecules in the liquor steam passing through distilling tower. Then, the tiniest alcohol molecules enter the cooling unit to be condensed. Residual liquor steam unable to pass through the distilling tower is condensed to become inferior liquor and then conducted back to the cracking unit to be heated, cracked and reformed again to achieve a repeatedly purifying circulation.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematically flowchart of a system for distilling liquor in accordance with the present invention;

Fig. 2 is a schematically flowchart of the system and devices in a cyclical process composed of a cracking unit and a purifying distilling unit in Fig. 1; and

Fig. 3 is a cross-sectional side plane view of the devices applied to the system in the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A system for distilling liquor and devices for the system in the present invention is shown schematically in Fig. 1 in a generalized fashion. The system is designed for a separably multilayer configuration and comprises multiple devices containing a bottom layer A, a middle layer B, a top layer C, and an outer cooling assembly D and four units correspondingly arranged in the multiple devices. The bottom layer A contains a heating unit 10. The middle layer B contains a cracking unit 20. The top layer B contains a purifying distilling unit 30. The outer cooling assembly D contains a cooling unit 40. Particularly, the bottom layer and the middle layer are two individually hermetical layers. Initially, water for boiling is conducted into the heating unit 10 in the bottom layer A and alcoholic paste (or fermented liquid such as wort) is conducted into the cracking unit 20 in the middle layer B. In the heating unit 10, the water is heated to boil to generate steam and then the steam is introduced into the cracking unit 20 in the middle layer B. The steam heats the alcoholic paste in the cracking unit 20 to generate liquor steam. The liquor steam is cracked in the cracking unit 20 to generate alcohol molecules having finer quality. The alcohol molecules arise to the purifying distilling unit 30 in the top layer C. The cracking unit 20 and the purifying distilling unit 30 communicate with each other to achieve a cyclically cracking and purifying process (as shown by arrows in Fig. 1). Impurities in the alcoholic paste and inferior alcohol molecules unable to be cracked are deposited back to the cracking unit 20 to become waste residuum. In the purifying distilling unit 30, the tiniest great alcohol molecules pass through the purifying distilling unit 30 and enter the cooling unit 40 in the outer cooing assembly D. Additionally, residual liquor steam unable to pass through the purifying distilling unit 30 is conducted back to the cracking unit 20 in the middle layer B. In the outer cooling assembly D, the great alcohol molecules are condensed and then awaken (esterified) to achieve fine

liquor having excellent quality and dense aromatic smell.

Fig. 2 is a schematically flowchart of the devices particular in a cylindrical process composed of the cracking unit and the purifying distilling unit. In Fig. 2, the main feature in the present invention is that alcoholic paste pours into the cracking unit 20 and heat by steam from the heating unit 10 on a dividing plate 205 to generate the liquor steam. The liquor steam is introduced into a dissociating reducing device 202 and flush to the device 202 at high speed. Then, great alcohol molecules are separated from inferior alcohol molecules in the liquor steam. The inferior alcohol molecules unable to be cracked are condensed to become inferior liquor and then conducted back to the dividing plate 205. The inferior liquor is vaporized again to complete a cyclic cracking process. The great alcohol molecules after cracking are reformed to become lighter liquor steam having excellent quality. Then, the reformed liquor steam arises to a distilling tower 302 to be purified and distilled. By a purifying sieving effect of the distilling tower 302, inferior alcohol molecules unable to pass the distilling 302 are condensed to become inferior liquor and conducted back to the dividing plate 205. The inferior liquor is heated and cracked again to complete a repeatedly purifying process. The great alcohol molecules are introduced into the cooling unit 40 and condensed to achieve great liquor. The system is terminated when alcohol concentration of the great liquor below a desired value. Then, the great liquor is awaked (esterified) to further increase aromatic smell and mellow taste.

Fig. 3 is a schematically cross-sectional view of the devices in accordance with the present invention. The devices in the system for distilling liquor, in preferred embodiments, are designed into separably multiple layers comprising a bottom layer A, a middle layer B, a top layer C, and an outer cooling assembly D. The bottom layer A

contains a heating unit 10, the middle layer B contains a cracking unit 20, the top layer C contains a purifying unit 30, and the outer cooling assembly D contains a cooling unit 40. The bottom layer A and the middle layer B are hermetical. The heating unit 10 in the bottom layer A has a heater 101 inside, a heating chamber 102, a water inlet 103, a water-level monitoring panel 1031, an impurity depositing areas 104 around the heater 101, impurity outlet 105, waste water outlet 106, and a steam pipe 108. The heater 101 connects to a base of the heating unit 10 to directly receive heat from an outer heating device 70 and is composed of multiple stainless steel tubes arranged in a circle and a cone-shaped cap mounted on the stainless steel tubes. A gas outlet 107 is attached to one side of the heater 101 to drain overmuch gas out from the heating unit 10. The heating chamber 102 has an inner wall made of thermal-conductive and anti-corrosive material to serve as a thermal-exchanging wall 1021 to absorb heat and to evenly heat the water to cause reflux and to accelerate the boiling of the water to generate the steam. The steam is introduced into the cracking unit 20 via the steam pipe 108. The water inlet 103 conducts the water into the heating unit 10 or selectively connects with a cleaning device (not shown) to clean the system. The impurity depositing area 104 accommodates impurities and then the impurity outlet 105 drains the impurities out of the heating unit 10. The waste water outlet 106 drains waste water out of the heating unit 10. Preferably, the water inlet 103 in the heating unit 10 is controlled by an automatically controlling system to control quantity of the water and to automatically supply the seawater into the heating chamber 102.

The cracking unit 20 in the middle layer B has a dividing plate 205 with multiple steam holes 2051 attached at a bottom of the cracking unit 20. The steam in the heating unit 10 injects to the cracking unit 20 via the steam holes 2051. An impurity depositing

groove 2052 is defined in annularity on the dividing plate 205 for storing the impurities. A waste water outlet 206 communicates to the impurity depositing groove 2052 to drain out the impurities. A dissociating reducing device 202 is secured in the middle layer B above the dividing plate 205 and has multiple manifold pipes 2021 attached to the dissociating reducing device 202. Residual space in the middle layer B is defined as a steam chamber 204. The dissociating reducing device 202 is a round-shape constructed in a singular layer clamped by a top plate 2022 and a bottom plate both preferably made of stainless steel and have multiple round holes 20221. Selectively, the dissociating reducing device 202 is designed for a boiler. The steam chamber 204 has an inner wall made of thermal-conductive and anti-corrosive material. An inlet 203 with a water-level monitoring panel 2031 is attached to one side of the steam chamber 204. The inlet 203 conducts the alcoholic paste into the cracking unit 20 and the waste water outlet 206 drain waste water and residuum out of the system. Heating steam conducted via the steam pipe 108 heats the alcoholic paste on the dividing plate 205 in the cracking unit 20 to generate liquor steam. The generated liquor steam flushes to the dissociating reducing device 202 at high speed to cause frictional effect. By the frictional effect, the dissociating reducing device 202 vibrates to crack and reform alcohol molecules in the liquor steam. Inferior alcohol molecules are separated from great alcohol molecules in the liquor steam and are condensed to become inferior liquor. The inferior liquor is conducted back to the dividing plate 205 to heat and vaporize again to complete a cyclic cracking process. The great alcohol molecules after cracking are reformed to become light liquor steam to arise to the purifying distilling unit 30.

The purifying distilling unit 30 in the top layer C has a distilling tower 302 constructed at a top of the purifying distilling unit30. The distilling tower 302 is

composed of multiple distilling layers 3021 and each distilling layer 3021 has multiple ventilating holes 3022 defined therein. Each distilling layer 3021 is a dome-shape has a top convex surface and a bottom concave surface to guide the liquor steam, which is unable to pass through the purifying distilling unit 30, back to the cracking unit 20 in the middle layer B. Residual space in the top layer C is defined as a liquor steam chamber 301. The high temperature liquor steam flushes to the multiple distilling layers 3021 in the distilling tower 302 and the ventilating holes 3022 in the distilling layer 3021 to cause physically guiding effect. Thereby, alcohol molecules in the liquor steam from the cracking unit 20 are sieved. Only the tinies and great alcohol molecules are allowed to pass through the purifying distilling unit 30 to reach the outer cooling assembly D. Residual inferior alcohol molecules are condensed to become inferior liquor. The inferior liquor is conducted back to the dividing plate 205 to be heated and cracked again to complete a repeatedly purifying process.

The layers A B C with three corresponding units are piled into a cylinder. The dividing plate 205 in the middle layer B is hermetically combined with the bottom layer A. The middle layer B and the top layer C are hermetically combined by means of engaging rings 201 attached on a top of the middle layer B.

The cooling unit 40 in the outer cooling assembly D has gas pipe 401, a condensing chamber 402, an awaking layer 403, and an alcohol detecting device 60. The gas pipe 401 introduces the great alcohol molecules in the liquor steam from the purifying process into the condensing chamber 402 having multiple cooling devices 4021. Before entering the condensing chamber 402, the liquor steam is detected with the alcohol detecting device 60 to know the alcohol concentration of the liquor steam. A cold water chamber 4022 is constructed around the condensing chamber 402. A water

outlet 4024 is attached to an upper portion of the cold chamber 4022 and a water inlet 4023 is attached a lower portion of the cold chamber 4022. Cold water or iced water is conducted into the cold water chamber 4022 via the water inlet 4023 to condense the liquor steam in the multiple cooling devices 4021 to generate liquor having high purity. When the cold water or the iced water gets warm, the warm water is drained out from the cold water chamber 4022 via the water outlet 4024. The generate liquor in the cooling device 4021 is introduced into the awaking layer 403 below the condensing chamber 402 to esterify the liquor. Thereby, the liquor has dense aromatic smell. Lastly, the awaken liquor is dropped into a container 405 via a connecting tube 404. The alcohol detecting device 60 detects and monitors the alcohol concentration of the liquor. When the alcohol concentration is lower a desired value, the alcohol detecting device 60 automatically stops the heating unit 10 to interrupt the system. Cleaning water is poured into the middle layer B via the inlet 203 to wash waste residuum out of the system via the waste water outlet 206.

When operates the system, the inlet 203 is connected to a supplying device 50 storing alcoholic paste. The alcoholic paste is pumped into the middle layer B by pumps. Quantity of the alcoholic paste inside the middle layer B is monitored by the water-level monitoring panel 2031. The water is conducted to the heating unit 10 in the bottom layer A via the water inlet 103 to enter the heating chamber 102. Flammable gas, heavy oil, electrothermal energy, solar energy or steam from boilers is provided to heat the bottom of the heating unit 10. The heater 101 receives the heat from the bottom of the heating unit 10 and transmits the heat to the alcoholic paste by the stainless steel tubes that are arranged in a cycle to increase more heating areas. The water is heated and then generates currents to accelerate the heating. Additionally, the thermal exchanging wall

1021 made of thermal-conductive and anti-corrosive material evenly transmits heat to the water when the water reaches a boiling temperature. The water boils in the heating unit 10 and generates a lot of steam. Then, the steam is introduced into the dividing plate 205 via the steam pipe 108 to heat alcoholic paste in the cracking unit 20. Because the dividing plate 205 is shaped into a disk with an annular concave, the steam injects into the cracking unit 20 via the multiple holes 2051 to heat the alcoholic paste to boil and generate liquor steam. The generated liquor steam flushes upward to the dissociating reducing device 202 to cause high temperature impact and high speed friction. The dissociating reducing device 202 then vibrates to crack and reform alcohol molecules in the liquor steam. By the thermal friction, impurity alcohols in the liquor steam are cracked and burned to accelerate dissociation of molecules in the liquor steam. Thereby, great alcohol molecules are separated from inferior alcohol molecules. The inferior alcohol molecules unable to pass the dissociating reducing device 202 is condensed to become inferior liquor and then conducted back to dividing plate 205 to be heated and vaporized again to complete a cracking process. Impurities in the alcoholic paste and residuum unable to be cracked both deposit in the impurity depositing area 2052. The great alcohol molecules compose fine liquor steam and arise to the purifying distilling unit 30.

The great alcohol molecules from dissociating reducing device 202 enter the liquor steam chamber 301 to pass the distilling tower 302. The great alcohol molecules fills the three distilling layers 3021 in the distilling tower 302 secured at the top of the purifying distilling unit 30. The liquor steam flushes and impacts the multiple distilling layers 3012 having multiple ventilating holes 3022 to cause physically inducing effect to sieve the liquor steam after cracking and reforming in the cracking unit 20. The great

alcohol molecules in the liquor steam able to pass through the distilling tower 302 are introduced into the cooling unit 40 and then are condensed. Residual liquor steam unable to pass through the distilling tower 302 is conducted back to the dividing plate 205 in the cracking unit 20 since each distilling layer 3021 is shaped as a dome. The liquor steam conducted back to dividing plate 205 is heated and cracked again to complete a repeated purifying process.

The liquor steam passing the distilling tower 302 is introduced into the cooling unit 40 via the gas pipe 401 and is examined with the alcohol detecting device 60 before enters the condensing chamber 402. In the cooling unit 40, the sieved alcohol molecules in the liquor steam are introduced into the cooling device 4021 in the cooling chamber 402. The cooling device 4021 is surrounded by the cold water chamber 4022 with the inlet 4023 and the outlet 4024. When the cold water or the iced water fills in the cold water chamber 4022, heat of the liquor steam is transferred to the cold water or the iced water so that the liquor steam is condensed to become liquor. Lastly, the liquor is drained to the helically awaking layer 403 to be quickly cool down in the awaking layer 403. In the awaking layer 403, the liquor is further esterified to become mellow. The esterified liquor is dropped via the connecting tube 404 and collected in the container 405.

The alcohol detecting device 60 detects and monitors the alcohol concentration of the liquor. When the alcohol concentration is lower a desired value, the alcohol detecting device 60 automatically stops the heating unit 10 in the bottom layer A to interrupt the system. Then, cleaning water is poured into the middle layer B via the inlet 203 to wash waste residuum out of the system via the waste water outlet 206.

By a cyclic process composed of the cracking unit 20 and the purifying distilling unit 30, the cracking process in the dissociating reducing device 202, and the purifying

process in the distilling tower 30, the alcoholic paste is boiled to generate liquor steam and the alcohol molecules in the liquor steam is cracked, reformed, sieved, and then condensed to achieve the liquor having excellent quality.

When the device assembly Z in the present invention is cleaned, the water inlet 103 selectively connects with a detergent supplier to input detergents into the system, wherein the detergent is preferred to be non-toxic citric acid. The waste water outlet 106 and the impurity outlet 105 enable to respectively drain residual alcoholic paste and impurities out the system. Because the inner walls of the heating chamber 102 and the steam chamber 204 are made of stainless steel, devices in the system are not easily coated with limescale and not be corroded by the alcoholic paste so that frequency of cleaning the system is reduced.

Main feature of the present invention is to use a cyclically and repeatedly process composed of the cracking unit 20 and the purifying distilling unit 30, multiple cracking processes in the dissociating reducing device 202, and repeatedly purifying processes in the distilling tower 302 to crack and reform the alcohol molecules in the liquor steam to generate mellow liquor.

Although particular and specific embodiments of the invention have been disclosed in some detail, numerous modifications will occurs to those having skill in the art, which modifications hold true to the spirit of this invention. Such modifications are deemed to be within the scope of the following claims.